AGC Programming Memo #29

To: Distribution
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Subject: NORMUNIT and QUICTRIG

A couple of nice things have materialized lately: NORMUNIT, NORMUNX1, and QUICTRIG.

NORMUNIT is an RTB op-code capable of unitizing any vector not exactly zero in all components. (UNIT overflows when all components are less than 8 bits big.) Also, NORMUNIT is more accurate for small vectors. Its method is to shift each component of the vector left 13 bits when the upper order parts of all components are discovered to be zero; it then proceeds to the UNIT routine. Call NORMUNIT like this: -

```
    VLOAD    RTB
             VECT
             NORMUNIT
    STORE    UNITVECT
```

The vector magnitude left by NORMUNIT (in 36D) may be too big by 2^{13}. The vector magnitude squared may be too big by 2^{26}. For users who may desire to use these outputs meaningfully, a second version, called NORMUNX1, has been provided. In NORMUNX1, when the vector is shifted left 13, +13 is left in X1; otherwise 0 is left there. Thus users may do an indexed shift to correct the magnitudes, for example: -

```
VLOAD      RTB
           VECT
           NORMUNX1
STODL      UNITVECT          To correct 34D make the same
           36D               shift twice.
SL*
           0, 1
STORE      MAGVECT
```

It would be easy to provide still another version which stores the shift count in X2, S1, S2, or anywhere in the vac area.

Very recently a routine called QUICTRIG was added to the powered flight subroutines. QUICTRIG computes the sines and cosines of the three 2's complement angles it finds at CDUSPOT, CDUSPOT +2, and CDUSPOT +4 and stores these double precision, scaled at 2, at SINCDU and COSCDU, in the same order as the inputs. QUICTRIG differs from CD*TR*GS in three ways: it does not leave the 1's complement version of the angles at CDUSPOT; it is nine times as fast (40-45 ms faster); it is slightly less accurate. QUICTRIG is intended for guidance cycle use where time is critical. QUICTRIG is an RTB op-code. From basic it should be called as follows:

```
                 BANKCALL
TC       ~~USPRCADR~~      ~~Which is not much worse than a BANKCALL.~~
CADR     QUICTRIG
```

TRG*SMNB and TRG*NBSM will continue to use the slower CD*TR*GS. Their faster equivalents are:

```
RTB    CALL          RTB    CALL
       QUICTRIG             QUICTRIG
       *SMNB*               *NBSM*
```

QUICTRIG uses the single precision trigonometry routines SPSIN and SPCOS.